Progression Model – Year 10 Chemistry (Separate)

Module Title: Quantitative chemistry	**Module Title:** Chemical changes	**Module Title:** Energy changes
Learning Intent for this module: This module presents a quantitative approach to chemical masses as students deepen their understanding of atomic structure by acquiring knowledge and understanding of isotopes and relative atomic mass. Students will then develop their mathematical skills further by looking at key concepts such as moles, the importance of mass conservation and calculating uncertainty and concentration. They will also study gas volumes and yield economy. • Isotopes • Relative atomic mass • Conservation of mass • Moles and reacting masses • Uncertainty • Concentration • Gas volumes • Yield economy	**Learning Intent for this module:** Students are introduced to this module with retrieval and extension of previous knowledge of reactions including the reactivity of metals. They will then learn about neutralisation reactions of acids with metals, oxides, hydroxides, and carbonates which leads to the preparation of a pure, dry salt in required practical 1. This links to the concept of ionic substances that they first learned about in year 9. Students go onto learning about reactions in terms of reduction and oxidation, a key concept which will be revisited in this module. They will learn about electrolysis using molten ionic substances and ionic substances dissolved in aqueous solutions. Students will discover a practical application of electrolysis as the basis for aluminium extraction. • Reactivity series • Reactions of metals and acids • Acid dissociation • Neutralisation reactions • Reduction and oxidation • Required practical (preparation of a pure, dry salt) • Required practical (titrations) • Electrolytes • Electrolysis of molten substances • Electrolysis of substances dissolved in aqueous solution • Required practical (electrolysis)	**Learning Intent for this Module:** After learning about endothermic and exothermic reactions in KS3, students will develop their understanding of this concept in this module. This module establishes students' understanding of energy changes in the context of a model of a reaction where bonds are broken in the reactants and formed in the products. Students will then learn what bond energies are and then how to use bond energies to calculate an overall energy change a reaction. Students will learn to mathematically determine if a reaction is endothermic or exothermic. Students are then introduced to how the rate of reaction is determined by the frequency of collisions and energy of the reactant particles. They will then learn about reversible reactions and the concept of equilibrium, including le Chatelier's principle. • Endothermic and exothermic reactions • Energy rection profiles • Bond energy calculations • Required practical (temperature changes)

Key Content to be learned: Building on their understanding of atomic structure, students will learn about isotopes. They will then go onto develop their numerical skills by learning how to calculate relative atomic mass, uncertainty and concentration. Law of conservation of mass is introduced as students will learn about the importance of balancing equations. Students will then go onto revisit and expand on knowledge of reactions of metals and the reactivity series.	**Key content to be learned:** In this module, students learn about neutralisation reactions and how reactions of metals, metal oxides, hydroxides and carbonates can lead to the production of soluble salts. Students will learn to define and explain the difference between strong and week acids. Students will learn about the concept of electrolysis and how electrolytes are ionic substances. They will learn about the two types of electrolysis which involve molten electrolytes and electrolytes dissolved in an aqueous solution. Students will be able to predict products of electrolysis and explain the reactions in terms of oxidation and reduction and write half equations to show this.	**Key Content to be learned:** In this module students will recall and build upon previous knowledge of exothermic and endothermic reactions. They will deepen their understanding by learning about reaction profiles and how these link to chemical reactions. Students will learn about rates of reaction and the ways rate can be calculated. They will learn about the theory of collision theory and how it underpins chemical reactions before moving on to the concept of reversible reactions and dynamic equilibrium. They will use Le Chatelier's principle to predict the position of equilibrium when reaction conditions are changed.
Prior knowledge: • A simple model of the atom consisting of the nucleus and electrons • The modern Periodic Table, showing elements arranged in order of atomic number • Chemical reactions as the rearrangement of atoms • Representing chemical reactions using formulae and using equations	**Prior knowledge:** • Defining acids and alkalis in terms of neutralisation reactions • The pH scale for measuring acidity/alkalinity; and indicators • Reactions of acids with metals to produce a salt plus hydrogen • Reactions of acids with alkalis to produce a salt plus water • Simple techniques for separating mixtures • Types of chemical bonding: ionic, covalent, and metallic • Bulk properties of materials related to bonding and intermolecular forces	**Prior knowledge:** • Exothermic and endothermic chemical reactions • What catalysts do
Key tasks for this module: • Quantitative chemistry • Moles	Key tasks for this module: • Preparation of a pure, dry salt. • Electrolysis	Key tasks for this module: • Energy changes • End of year test